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Indian Petroleum Act (VIII of 1899)

TWENTY-THIRD ANNUAL REPORT

OF THE

Chief Inspector of Explosives in India

BEING HIS ANNUAL REPORT FOR THE YEAR ENDING
31ST MARCH 1922.



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Twenty-third Annual Report of the Chief Inspector of Explosives in India.

No. 1470.

FROM

DR. N. L. SHELDON, PH.D., F.I.C.,

Chief Inspector of Explosives in India,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

DEPARTMENT OF INDUSTRIES,

SIMLA.

Calcutta, the 8th August 1922.

SIR,

I have the honour to submit herewith a report of the work of my department during the year ending 31st March 1922.

2. Mr. S. E. Bird, Personal Assistant to the Chief Inspector of Explosives, who was on combined leave out of India returned to duty on the 16th November 1921.
- Personnel.

EXPLOSIVES.

3. During the year 1921, 205 licenses (nineteen more than in the previous year) were granted in British India under Rule 46 and items 10 and 11 of Schedule II of the Indian Explosives Rules, 1914. The number of magazines licensed was 255 or 10 more than in 1920, and is in excess of the number of licenses granted, because in a number of cases firms have two or more magazines in one place under one license. A statement showing the number and location of the magazines and also the number of licenses granted in British India during the year 1921 is given in Appendix A, and a statement showing the number of magazines and licenses granted during the past ten years is shown in Appendix B.

4. During the year, 276 inspections of magazines were made; a number of magazines being inspected two or three times. Those magazines are inspected most frequently which are situated in the neighbourhood of towns or in populous localities, or which contain large quantities of explosives, or any explosive which on account of its greater susceptibility to decomposition and possible ignition, it is considered advisable to examine and test more frequently than other explosives.

5. The magazines generally are in good order, and as usual magazine-owners have been found most willing to carry out recommendations even when involving considerable expense, and my thanks are due to them for making my duties easy in this respect.

6. The physical condition of all the explosives in the different magazines during the year was found to be good with the following exceptions which were found to have become defective and were destroyed :—

- (a) 2 detonators from the magazine of the Andra Valley Power Supply Company at Tarkheda.
- (b) 5 lbs. and 42 cartridges of gelignite from the magazine of the Bombay Baroda and Central India Railway at Jekot.
- (c) 200 dynamite cartridges from the Bengal Nagpur Railway Company's magazine at Saranda.
- (d) 9,854 lbs. ammonal from Messrs. Best and Company's magazine at Korukupet.
- (e) 25 lbs. ammonal and 441 detonators from the Madras Mica mines magazine at Kalichedn.
- (f) 4½ lbs. gelignite from the Great Indian Peninsula Railway Company's magazine at Betul.
- (g) 247 maunds 11 seers of gunpowder from the Public Works Department magazine at Manghla.

7. During the year under report two cases of theft of explosives were reported to this office.

Thefts.

8. Two thousand five hundred and eleven tons of explosives were imported into British India during the year 1921, the value being Rs. 28,12,938.

Import of explosives.

Full details showing the different kinds of explosives imported, and the value of each are given in Appendix C. A comparative statement showing the quantity of explosives imported during the last ten years is given in Appendix D.

9. A list of explosives at present authorised for importation, manufacture, transport, possession, or sale in British India was published in the *Gazette of India* for information and is given in Appendix E.

Authorised explosives.

10. Two licenses granted by the Governor General in Council for the manufacture of 1,000 and 500 lbs. gunpowder respectively in the Central Provinces were renewed during the year.

Manufacture of explosives.

11. No large firms have as yet started the manufacture of gunpowder in India. It is exceedingly desirable that the manufacture of this article should be taken up by responsible Companies in the neighbourhood of coal fields. A number of accidents occur when country gunpowder is being manufactured with unsuitable plant by small contractors.

PETROLEUM.

12. During the year under report, 866 licenses for the storage of non-dangerous petroleum, regarding which this department was concerned or consulted, were granted. This is an increase of 24 as compared with last year. A list of these installations, corrected up to 31st December 1921 and showing the districts in which they are located, is given in Appendix F, and a statement showing the number of licenses granted during the past ten years is given in Appendix G. In addition to the number of licenses shown in Appendix F, there are, of course, a very large number of storage godowns for the possession of non-dangerous petroleum in non-bulk, licensed by District officers, of which this Department has no cognizance.

Number of petroleum installations.

13. There are also a very large number of godowns licensed for the storage of dangerous petroleum in non-bulk throughout the country, and the Inspectors of Explosives and the Chief Inspector of Explosives have inspected these, when their existence has been brought to our notice or where they are near non-dangerous petroleum installations or contain 500 gallons of petrol or more.

14. Many installations are under construction for the storage of dangerous petroleum in bulk and licenses were issued in form P for those completed. A number of special licenses were also granted under Rule 6, Chapter IV, Part II of the rules for storage of dangerous petroleum in underground tanks under the Bowser or similar systems. A copy of the revised conditions recommended by me for those premises is given in Appendix M.

15. In all 623 inspections of non-dangerous and partly dangerous and partly non-dangerous petroleum premises were made. Four hundred and seventy-seven inspections of dangerous petroleum premises were also made by this department during the year.

16. The large petroleum installations are usually under efficient European supervision and are in good order and well looked after.

17. The small or minor petroleum installations are installations in which not more than 50,000 gallons of kerosine oil in combined bulk and non-bulk are stored, and are looked after by Indian Agents, employed by the large oil firms. The oil for these installations is supplied from the major installations at the different ports, and the retail trade is carried out in them. A great deal of inspection of these minor installations has been done by this department with the result that their condition is very much improved and the generality of them are in very good order. As a matter of fact when an installation is found not up to the mark at an inspection, it is usually due to the fact that some new Agent has been recently appointed who has not realised what is required of him. The oil companies do not hesitate to change their Agents if several unsatisfactory reports are made of the installations under their charge.

18. During the year 1921, 94,174,209 gallons of non-dangerous petroleum and 65,507 gallons of dangerous petroleum were imported by sea into British India. The details are given in Appendix H, and also the quantity of non-dangerous and dangerous petroleum produced in Assam and Burma during the year as well as during the past ten years.

ACCIDENTS.

19. A list of accidents, with a short account of each, that have occurred with explosives, inflammable substances, dangerous goods, etc., between the 1st January and 31st December 1921 and that have been reported to this department, is given in Appendix I. It will be seen from a perusal of the details that the accidents have practically all been caused by gross neglect of ordinary precautions. In all there were 29 accidents causing 29 deaths and injuries to 64 persons. Comparative statements given in Appendices K and L show the total number of accidents and the number of persons killed or injured by them during the last ten years. As stated in previous reports, it is very doubtful whether all accidents that occur are duly reported to this department and, therefore, it is very possible that the statistics given are underestimated.

As a rule, the only accidents that are entered in Appendix I are those which cause loss of life or injuries or are important from some point of view.

Gunpowder, Class I.

20. There were five accidents from gunpowder during the year, causing seven deaths and injuries to four persons.

Nitro-compounds, Class III.

21. There was one accident from nitro-compounds causing 18 injuries.

22. Four accidents from fulminates, causing two deaths and injuries to six persons were reported during the year.
 Fulminates, Class V.
23. There were two accidents from ammunition causing the death of two persons and injuries to ten others.
 Ammunition, Class VI.
24. Five accidents from fireworks caused the death of six persons and injuries to four.
 Fireworks, Class VII.
25. There were seven accidents from petroleum during the year, which were responsible for eight deaths and injuries to twenty persons. It will be seen from a perusal of the accidents in Appendix I that carelessness is a prominent feature in most of them. In India the petroleum accidents are caused usually by lights being brought into proximity to oil vapour.
 Petroleum.
26. There was one serious accident on the Burma Oil Company's pipe line between Singu and Naughlya at a point where it passes through the Yenangyaung Myaukchaung resulting in three deaths. The pipe line is being removed.
27. A number of fires were reported to this office as having occurred this year at the oil wells and refineries in the Burma Oil Fields.
 Chemicals.
28. There were no accidents from chemicals reported during the year.
29. There were three miscellaneous accidents causing the death of four persons and injuries to two others.
 Miscellaneous.

GENERAL REMARKS.

30. Fifteen reports of inspection of these magazines by civil officers have been received in this office, and I have Government magazines in charge of civil officers. brought to the notice of the officers concerned any irregularities or defects which required remedying. There is no doubt that the introduction of this system of sending these reports to this office has been desirable, as even from the short time it has been in existence, I have come across a good many instances of ignorance and want of expert knowledge, which might have caused disasters. High explosives in these magazines had previously never been tested, and I have in dealing with these reports, always recommended that samples of these explosives should be sent at least once a year to Chemical Examiners for test.

Four State Railway magazines have been inspected by this Department during the year, as the Railway Board desired that this Department should undertake those inspections.

31. The license to manufacture and possess in a Factory, Toy Fireworks containing Fulminate of Silver granted to Messrs. Bonbonniere, Limited, Calcutta, was renewed during the year. The maximum quantity of free explosive allowed in the Factory at any one time is limited to 24 grains.

32. On the 11th May 1921 whilst seven barges containing high explosive were being towed through the Port of Calcutta and under Howrah Bridge a serious accident occurred, which, but for prompt action, would have caused very serious loss of life and destruction to property. A detailed report on this accident is given in Appendix N.

33. The introduction of the use of Form O of the Rules under the Petroleum Act in all Provinces has been recommended. This form is a license for a pipe line to transport petroleum. The definition of a pipe line and the conditions of a license in Form O, as recommended by this Department, are given in Appendix O.

34. The first shipment of petrol in bulk was landed at Pir Pau in Bombay Harbour in May 1922 from the S.S. "Singu." The transport by train of petrol in kerosine tins in cases across India from Calcutta and Madras to Bombay is now no longer necessary and is being stopped.

35. The Commissioners for the Port of Calcutta asked for a ruling on the bunkering of liquid fuel or coal, etc., on vessels. loading of oil tankers with bunker coal and I stated that I thought—

(1) No bunkering of any sort whether of liquid fuel or coal, etc., should be permitted when dangerous petroleum in bulk or non-bulk is being loaded into or discharged from a tanker either in the stream or against the Jetties.

(2) Bunkering with liquid fuel or coal, etc., can be permitted at all times when non-dangerous petroleum in bulk or non-bulk is being loaded into or discharged from a tanker either in the stream or against the Jetties provided electric light only is used during the night time.

36. In reply to an enquiry from the Commissioners for the Port of Rangoon,

Bunkering of oil burning vessels.

I gave it as my opinion that oil burning vessels could safely be bunkered with oil fuel having a flash point of over 150°F. when lying alongside any wharf from an oil pipe ring main laid in masonry channels covered with iron plates along the wharf sides, the pipes being provided with valves at certain intervals so that the supply of oil can be cut off any section of the system in the event of leakage. The oil supply to the pipe system to be from an elevated storage tank filled by pressure from tank barges lying alongside a special oil wharf placed below the shipping.

As it will not always be possible to provide such a system it may become necessary to bunker vessels from tank barges direct, and this I am of opinion should only be done at moorings, no lighters or small cargo boats, etc. etc., being allowed during the process of bunkering within 100 yards of the vessel on the same side as the tank barge. Provided this rule could be enforced, I see no reason why bunkering should not be safely carried out at moorings not necessarily below the shipping.

I do not consider it safe to bunker vessels lying alongside the ordinary wharfs from tank barges as these latter would certainly become hemmed in by small craft during the process of bunkering and in the event of a fire or serious leakage could not be rapidly cast off, which they could be under the conditions given in the paragraph above.

37. The number of inspections done by this Department during the year

Number of inspections made.

were 1,376. To give some idea of the work and the ground covered, I give the following details of the work done by the Inspectors of Explosives.

During the 12 months, 1st April 1921 to 31st March 1922, the two Inspectors at Calcutta and Bombay were away from head-quarters for 312 and 144 days and travelled 29,243 and 19,926 miles respectively.

The Chief Inspector of Explosives was on tour for 124 days, travelled 21,481 miles, and inspected 130 explosives magazines and 348 petroleum installations and godowns, and went on inspection duty to the Burma Oil Fields and visited the ports of Calcutta, Madras, Bombay, and Calicut, etc.

38. This office is now permanently located in Calcutta at No. 1, Council House Street.

I have the honour to be,

SIR,

Your most obedient servant,

N. L. SHELDON,

Chief Inspector of Explosives in India.

APPENDIX A.

List of Magazines and Licenses granted under Rule 46 and items 10 and 11 of Schedule II of the Indian Explosives Rules, 1914, for the year 1921.

Presidency or Province.	District.	MAGAZINES.			LICENSES.		
		Under renewed license.	Under new license.	TOTAL.	Renewed.	New.	TOTAL.
Assam	Cachar	2	...	2	1	...	1
	Lakhimpur	1	...	1	1	...	1
	Nowgong	1	...	1	1	...	1
	Sylhet	1	...	1	1	...	1
	TOTAL	5	...	5	4	...	4
Bengal	Burdwan	12	...	12	10	...	10
	Calcutta	3	...	3	1	...	1
	Darjeeling	3	...	3	3	...	3
	Hooghly	4	...	4	1	...	1
	Howrah	1	...	1	1	...	1
	24 Parganas	2	...	2	1	...	1
	TOTAL	25	...	25	17	...	17
Bihar and Orissa	Gaya	2	...	2	2	...	2
	Hazaribagh	13	5	18	10	5	15
	Manbhum	18	5	23	16	5	21
	Sambalpur	1	...	1	1	...	1
	Santal Parganas	1	1	2	1	1	2
	Singbhum	9	1	10	6	1	7
	TOTAL	44	12	56	36	12	48
Bombay	Ahmedabad	4	...	4	4	...	4
	Bombay	14	1	15	10	1	11
	Broach	1	...	1	1	...	1
	Karachi	5	...	5	3	...	3
	Kolaba	...	1	1	...	1	1
	Panch Mahals	1	...	1	1	...	1
	Poona	4	2	6	3	2	5
	Ratnagiri	2	...	2	2	...	2
	Surat	2	...	2	2	...	2
	Thana	4	...	4	3	...	3
	TOTAL	37	4	41	29	4	33

APPENDIX A—contd.

List of Magazines and Licenses granted under Rule 46 and items 10 and 11 of Schedule II of the Indian Explosives Rules, 1914, for the year 1921—contd.

Presidency or Province.	District.	MAGAZINES.			LICENSES.		
		Under renewed license.	Under new license.	TOTAL.	Renewed.	New.	TOTAL.
Burma.	Amhorst	1	...	1	1	...	1
	Bassein	1	...	1	1	...	1
	Hanthawaddy	4	...	4	2	...	2
	Katha	1	...	1	1	...	1
	Lower Chindwin	1	...	1	1	...	1
	Mergui	1	...	1	1	...	1
	Northern Shan States	3	3	6	2	1	3
	Pegu	1	...	1	1	...	1
	Tavoy	8	...	8	6	...	6
	Thaton	8	...	8	6	...	6
	Yemathin	...	1	1	...	1	1
TOTAL		20	4	33	22	2	24
Central Provinces	Amroeti	1	...	1	1	...	1
	Balaghat	3	1	4	3	1	4
	Betul	1	...	1	1	...	1
	Bhandara	2	...	2	2	...	2
	Bilaspur	1	...	1	1	...	1
	Chanda	3	1	4	2	1	3
	Chhindwara	3	1	4	3	1	4
	Nagpur	7	...	7	7	...	7
	Narsinghpur	1	...	1	1	...	1
	Raipur	3	...	3	4	...	4
TOTAL		25	3	28	25	3	28
Coorg	Mercara	...	1	1	...	1	1
	TOTAL	...	1	1	...	1	1
Hyderabad	Chamavallam	...	1	1	...	1	1
	TOTAL	...	1	1	...	1	1

APPENDIX A—concl'd.

List of Magazines and Licenses granted under Rule 46 and items 10 and 11 of Schedule II of the Indian Explosives Rules, 1914, for the year 1921—concl'd.

Presidency or Province.	District.	MAGAZINES.			LICENSES.		
		Under renewed license.	Under new license.	TOTAL.	Renewed.	New.	TOTAL.
Madras	Anantapur . . .	3	...	3	2	...	2
	Chingleput . . .	2	...	2	2	...	2
	Madras . . .	15	...	15	4	...	4
	Madura . . .	2	...	2	2	...	2
	Nellore . . .	7	...	7	3	...	3
	North Arcot . . .	2	1	3	2	1	3
	Ramnad . . .	1	...	1	1	...	1
	Salem . . .	3	...	3	2	...	2
	South Arcot . . .	2	1	3	2	1	3
	Tanjore . . .	15	...	15	15	...	15
	Tinnevely . . .	1	...	1	1	...	1
	Trichunopoly . . .	3	1	4	3	1	4
	Vizagapatam . . .	2	...	2	1	...	1
	TOTAL . . .	58	3	61	40	3	43
Panjab	Rawalpindi . . .	1	...	1	1	...	1
	TOTAL . . .	1	...	1	1	...	1
United Provinces	Lucknow . . .	1	...	1	1	...	1
	Meerut . . .	1	...	1	3	...	3
	Shahjahanpur . . .	1	...	1	1	...	1
	TOTAL . . .	3	...	3	5	...	5

SUMMARY.

Presidency or Province.	MAGAZINES.			LICENSES.		
	Under renewed license.	Under new license.	TOTAL.	Renewed.	New.	TOTAL.
Assam	5	...	5	4	...	4
Bengal	25	...	25	17	...	17
Bihar and Orissa	44	12	56	36	12	48
Bombay	37	4	41	30	3	33
Burma	20	4	33	22	2	24
Central Provinces	25	3	28	25	3	28
Coorg . . . . .	...	1	1	...	1	1
Hyderabad . . . . .	...	1	1	...	1	1
Madras	58	3	61	40	3	43
Punjab	1	...	1	1	...	1
United Provinces	3	...	3	5	...	5
TOTAL	227	28	255	180	25	205

APPENDIX B.

Summary of Magazines and Licenses granted under Rule 46 and items 10 and 11 of Schedule II for the ten years ending 1921.

Year.	MAGAZINES.			LICENSES.		
	Under renewed Licenses.	Under new Licenses.	TOTAL.	Renewed.	New.	TOTAL.
1912	199	18	217	146	15	161
1913	210	25	235	151	21	172
1914	210	35	254	160	32	192
1915	238	13	251	170	12	191
1916	216	26	242	168	22	190
1917	226	26	252	175	23	198
1918	238	13	251	183	10	193
1919	232	14	246	180	9	189
1920	237	8	245	180	6	186
1921	227	28	255	180	25	205

APPENDIX C.

Statement showing the imports of explosives by sea into British India from other countries in the year 1921.

Explosives.	Bengal.	Bombay.	Sind.	Burma.	Madras.	TOTAL.
<i>Quantity.</i>						
Gunpowder, black . lbs.	42,625	18,235	400	20,850	9,600	91,710
„ smokeless . „	8,575	8,725	400	200	4,500	22,400
Dynamite	285,000	3,000	...	15,000	220,000	523,000
Blasting gelatine . . .	...	2,000	...	...	100,000	102,000
Gelignite or gelatine dynamite.	100,062	63,750	...	105,000	137,500	406,312
Other nitro-compound explosives.	157,180	...	...	...	...	157,180
Detonators No.	2,007,096	...	...	393,106	694,500	3,094,702
Fireworks lbs.	65,107	2,939,263	61,816	468,052	135,569	3,719,807
TOTAL . lbs.	683,630	3,034,073	62,616	629,102	607,169	5,022,490
TOTAL . No.	2,007,096	...	...	393,106	694,500	3,094,702
<i>Value in rupees.</i>						
Gunpowder, black. . . .	82,005	37,831	858	17,009	13,440	151,143
„ smokeless	35,180	19,691	850	1,047	7,592	64,360
Dynamite	236,013	2,627	...	27,450	189,645	455,735
Blasting gelatine . . . .	...	2,069	...	...	98,365	100,434
Gelignite or gelatine dynamite	86,196	54,824	...	100,075	124,545	425,640
Other nitro-compound explosives.	138,108	...	...	...	...	138,108
Detonators	82,435	...	...	24,291	29,520	136,246
Fireworks	101,254	913,475	44,567	183,048	58,838	1,341,182
TOTAL	851,281	1,030,517	46,275	362,920	521,945	2,812,938

APPENDIX D.

Comparative statement showing the imports of explosives by sea into British India from other countries for the ten years ending 1921.

Explosives.	1912	1913.	1914	1915	1916	1917.	1918	1919	1920	1921
Gunpowder, black . lbs.	351,883	213,713	240,821	137,367	111,265	96,450	62,500	131,080	117,740	91,710
" smokeless "	17,625	21,470	11,805	13,323	33,585	7,116	26,965	57,485	5,550	22,460
Dynamite . . . "	230,000	431,306	517,076	214,782	323,328	152,060	248,404	414,098	303,800	523,000
Blasting gelatine . "	840,328	860,624	627,026	783,972	293,018	..	21,952	380,752	600,000	102,600
Gelignite or gelatiné dynamite "	311,344	202,548	201,100	105,172	836,400	1,237,466	1,026,500	601,584	326,925	406,312
Other nitro compound explosives. "	221,425	277,792	282,803	278,807	327,353	186,427	131,211	140,436	208,480	157,160
Detonators . . No	3,640,010	5,928,850	4,828,000	4,238,500	6,366,000	4,867,000	4,780,612	5,970,204	2,752,060	7,004,702
Fireworks . . lbs	3,181,411	2,270,869	2,651,861	2,630,527	2,076,592	2,165,370	1,162,657	1,291,131	2,782,388	7,719,897
TOTAL . lbs	5,213,016	4,324,322	4,532,042	4,468,452	4,541,001	5,814,800	2,710,282	3,016,515	4,344,383	5,022,199
TOTAL No	3,640,010	5,928,850	4,828,000	4,238,500	6,366,000	4,867,000	4,780,612	5,970,204	2,752,060	7,004,702

APPENDIX E.

DEPARTMENT OF EXPLOSIVES.

NOTIFICATION.

Calcutta, the 2nd March 1922.

No. 570.—With reference to the following Notifications publishing rules to regulate the manufacture, possession, sale, transport and importation of explosives, the following list of "Authorized Explosives" referred to in the rule mentioned against each Notification is published for general information :—

Rule 4 (3) of Notification No. 4013—33, dated the 6th June 1914, of the Government of India, Department of Commerce and Industry.

Rule 4 (3) of Notification No. 1183, dated the 11th November 1914, of the Chief Commissioner, Central Provinces, applicable to Berar.

Rule 4 (3) of Notification No. 14, dated the 23rd April 1915, of the Resident in Mysore applicable to the Civil and Military Station of Bangalore and on the Railways in Mysore under British Jurisdiction.

Rule 4 (3) of Notification No. 67-J., of the Resident at Hyderabad applicable to the dated the 28th August 1914, Cantonments of Secunderabad and Aurangabad, the Hyderabad Residency Bazars and

Rule 4 (3) of Notification No. 34-J., dated the 20th April 1915, the Railway lands in the Hyderabad State.

Rule 3 (3) of Notification No. 99, dated the 19th July 1916, of the Government of Burma applicable to the Northern Shan States.

Rule 3 (3) of Notification No. 5313, dated the 29th October 1918, of the Agent to the Governor General in Rajputana.

Rule 3 (3) of Notification No. 1812-B., dated the 10th November 1919, of the Agent to the Governor General in Central India applicable to Railway lands in Central India, specified in the Notification of the Government of India in the Foreign Department, No. 261-B., dated the 10th February 1913.

LIST OF AUTHORIZED EXPLOSIVES.

The following explosives are at present authorized for importation into British India for general sale :—

CLASS 1.—GUNPOWDER.

The term "gunpowder" means gunpowder ordinarily so called.

GUNPOWDER.

CLASS 2.—NITRATE MIXTURE.

The term "nitrate mixture" means any preparation, other than gunpowder ordinarily so called, formed by the mechanical mixture of a nitrate with any form of carbon or with any carbonaceous substance not possessed of explosive properties, whether sulphur be or be not added to such preparation, and whether such preparation be or be not mechanically mixed with any other non-explosive substance, and includes any explosive containing a perchlorate and not being a chlorate-mixture, fulminate or nitro-compound as defined in Rule 4 of the Indian Explosives Rules, 1914.

EVERY BLASTING EXPLOSIVE IN THIS CLASS, IN WHICH NITRATE OF AMMONIUM, NITRATE OF SODIUM OR CHLORIDE OF SODIUM ARE USED AS INGREDIENTS, SHALL BE CONTAINED IN CARTRIDGE WRAPPERS OR CASES (OR IN FIVE-POUND INNER PACKAGES) MADE THOROUGHLY WATERPROOF WITH MELTED PARAFFIN OR OTHER SUITABLE WATERPROOFING MATERIAL.

CHILWORTH SPECIAL POWDER.

CLASS 3.—NITRO-COMPOUND.

The term "nitro-compound" means any chemical compound possessed of explosive properties or capable of combining with metals to form an explosive compound, which is produced by the chemical action of nitric acid (whether mixed or not with sulphuric acid) or of a nitrate mixed with sulphuric acid upon any carbonaceous substance, whether such compound is mechanically mixed with other substances or not.

The nitro-compound class has two divisions.

EVERY EXPLOSIVE IN THIS CLASS AND EVERY EXPLOSIVE INGREDIENT THEREOF SHALL BE SO THOROUGHLY PURIFIED AND OTHERWISE OF SUCH CHARACTER AS TO SATISFY A TEST KNOWN AS THE HEAT TEST, AND SPECIFIED IN THE RULE FOR TESTING EXPLOSIVES PUBLISHED WITH GOVERNMENT OF INDIA, DEPARTMENT OF COMMERCE AND INDUSTRY, NOTIFICATION NO. 4013—33, DATED THE 6TH JUNE 1914, REFERRED TO ABOVE.

EVERY BLASTING EXPLOSIVE IN THIS CLASS, IN WHICH NITRATE OF AMMONIUM, NITRATE OF SODIUM OR CHLORIDE OF SODIUM ARE USED AS INGREDIENTS, SHALL BE CONTAINED IN CARTRIDGE WRAPPERS OR CASES (OR IN FIVE-POUND INNER PACKAGES) MADE THOROUGHLY WATERPROOF WITH MELTED PARAFFIN OR OTHER SUITABLE WATERPROOFING MATERIAL.

DIVISION 1.

Division 1 comprises the following explosives and any chemical compound or mechanically mixed preparation which consists either wholly or partly of nitro-glycerine or of some other liquid nitro-compound :—

Ardeer Gelignite.
Arkite. }
Samsonite }
A 1. Monobel. }
Victor Powder }
A. 2. Monobel. }
Viking Powder No. 1. }
Viking Powder No. 2. }
Ballistite.
Blasting Gelatine.
Cambrite No. 2.
Chilworth Smokeless Powder, No. 2.
Gordite.
Gordite, M. D.

Dynamite
Dynobel No. 2.
Dynobel (Export) No. 3 }
Dynobel No. 3. }
Dynobel No. 4. }
Farmer's Dynamite.
Gelatine Dynamite.
Gelignite.
Monobel, No. 1.
Rexite.
Arkite. }
Samsonite, }

PROVIDED THAT EVERY EXPLOSIVE IN THIS DIVISION SHALL BE OF SUCH CHARACTER AND CONSISTENCY AS NOT TO BE LIABLE TO LIQUEFACTION OR EXUDATION.

PROVIDED ALSO THAT AN EXPLOSIVE WHICH IS REQUIRED BY DEFINITION TO BE ISSUED IN WATER-PROOF INNER PACKAGES MAY BE EXEMPTED FROM SUCH REQUIREMENT BY SPECIAL AUTHORITY WHEN AND SO LONG AS THE CONDITIONS OF SUCH AUTHORITY ARE OBSERVED.

DIVISION 2.

Division 2 comprises the following explosives and any nitro-compound as before defined which not comprised in division 1.

Amberite No. 2.	Negro Powder No. 2.
Alumatol. }	Nobrite.
Ammonal. }	N. S. Smokeless.
Chilworth Smokeless Powder.	Picric Acid.
Chilworth Smokeless Sporting Powder.	Picric Powder.
Di-nitro-phenol.	Primrose Smokeless. }
Economic Smokeless Sporting Powder. }	Stowmarket Smokeless. }
E. C. Sporting Powder. }	Remington Dense Powder.
Eley Smokeless Sporting Powder. }	Roburite.
Empire Powder. }	Ruby Powder.
Light Load Smokeless. }	Schultze Cube Powder.
Frankite.	Schultze Gunpowder.
Fulmen Powder. }	Smokeless Diamond.
Imperial Schultze Gunpowder. }	Tonite or Cotton Powder.
Lightning Powder. }	Tri-nitro-toluol.
Guncotton.	
Ideal Powder. }	
Nobel's Special Powder. }	

CLASS 4.—CHLORATE MIXTURE.

The term "chlorate mixture" means any explosive containing a chlorate.

The chlorate mixture class has two divisions.

EVERY EXPLOSIVE IN THIS CLASS, AND EVERY EXPLOSIVE INGREDIENT THEREOF SHALL BE SO THOROUGHLY PURIFIED AND OTHERWISE OF SUCH A CHARACTER AS TO SATISFY A TEST KNOWN AS THE HEAT TEST, AND SPECIFIED IN THE RULE FOR TESTING EXPLOSIVES, PUBLISHED WITH GOVERNMENT OF INDIA, DEPARTMENT OF COMMERCE AND INDUSTRY, NOTIFICATION No. 4013—33, DATED THE 6TH JUNE 1914, REFERRED TO ABOVE.

EVERY BLASTING EXPLOSIVE IN THIS CLASS, IN WHICH NITRATE OF AMMONIUM, NITRATE OF SODIUM OR CHLORIDE OF SODIUM ARE USED AS INGREDIENTS, SHALL BE CONTAINED IN CARTRIDGE WRAPPERS OR CASES (OR IN FIVE-POUND INNER PACKAGES) MADE THOROUGHLY WATERPROOF WITH MELTED PARAFFIN OR OTHER SUITABLE WATERPROOFING MATERIAL.

DIVISION 1.

Division 1 comprises any chlorate preparation which consists partly of nitro-glycerine or of some other liquid nitro-compound.

Nil.

PROVIDED THAT EVERY EXPLOSIVE IN THIS DIVISION SHALL BE OF SUCH CHARACTER AND CONSISTENCY AS NOT TO BE LIABLE TO LIQUEFACTION OR EXUDATION.

DIVISION 2.

Division 2 comprises any chlorate mixture as hereinbefore defined, which is not comprised in Division 1.

Nil.

CLASS 5.—FULMINATE.

The term "fulminate" means any chemical compound or mechanical mixture, whether included in the foregoing classes or not, which, from its great susceptibility to detonation, is suitable for employment in percussion caps or any other appliances for developing detonation, or which from its extreme sensibility to explosion, and from its great instability (that is to say, readiness to undergo decomposition from very slight exciting causes) is specially dangerous.

This class consists of two divisions.

DIVISION 1:

Division 1 comprises such compounds as the fulminates of silver and of mercury, and preparations of those substances, such as are used in percussion caps; and any preparation consisting of a mixture of a chlorate with phosphorus or certain descriptions of compounds of phosphorus, with or without the addition of carbonaceous matter, and any preparation consisting of a mixture of a chlorate with sulphur, or with a sulphuret, with or without carbonaceous matter.

Nil.

DIVISION 2.

Division 2 comprises such substances as the chloride and iodide of nitrogen, fulminating gold and silver, diazobenzol, and the nitrate of diazobenzol.

Nil.

CLASS 6.—AMMUNITION.

The term "ammunition" means any explosive of any of the foregoing classes when the same is enclosed in any case or contrivance, or is otherwise adapted or prepared so as to form a cartridge or charge for small-arms cannon or any other weapon, or for blasting or to form any safety or other fuze for blasting or for shells, or to form any tube for firing explosives or to form a percussion cap, detonator, fog-signal, shell, torpedo, war-rocket, or any other contrivance other than a firework.

*The term "percussion cap" does not include a detonator.**

The term "detonator" means a capsule or case which is of such strength and construction and contains fulminate in such quantity, that the explosion of one capsule or case would communicate the explosion to other like capsules or cases.

The term "safety fuze" means a fuze for blasting which burns and does not explode, and which does not contain its own means of ignition, and which is of such strength and construction and contains an explosive in such quantity that the burning of such fuze will not communicate laterally with other like fuzes.

The ammunition class has three divisions.

DIVISION 1.

Nobel's Safety Electric Time Fuze.
Percussion Caps.
Railway Fog Signals.

Safety Cartridges.
Safety Fuzes for blasting.
Safety Electric Fuzes.

DIVISION 2.

Division 2 comprises any ammunition as hereinbefore defined, which does not contain its own means of ignition, and is not included in Division 1.

Cartridges for Blasting or other like purposes.

Cartridges for Small Arms which are not Safety Cartridges.

Cordeau Bickford.

Electric Fuzes.

Electric Primers.

Fuze Lighters.

Instantaneous Fuze.

Port Fires.

Tubes for firing Explosives.

Quick Match.

* In consequence of the results of experiments carried out, it has been decided that a percussion cap can only be properly classed as such if it contains less than 0.6 grain, of a composition of the 1st Division of the fifth (Fulminate) class of which not more than 25 per cent consists of fulminate of mercury or less than 0.5 grains, of any other explosive of the 1st Division of the 5th (Fulminate) class; and it has been further decided that percussion caps shall not be classed as such when they contain anvils or have their composition unprotected by tin foil or other suitable substance, as under those circumstances they are liable to explode en masse.

DIVISION 3.

Division 3 comprises any ammunition as hereinbefore defined which contains its own means of ignition, and is not included in Division 1.

Cartridges for Small Arms which are not Safety Cartridges.

Detonators.

Electric Detonators.

Friction Tubes.

Nobel's Electric Detonator Time Fuze.

Percussion Primers.

Tubes for firing Explosives.

CLASS 7.—FIREWORK.

"firework" comprises firework composition and manufactured fireworks.

DIVISION 1.—FIREWORK COMPOSITION.

The term "firework composition" means any chemical compound or mechanically mixed preparation of an explosive or inflammable nature, which is used for the purpose of making manufactured fireworks, and is not included in the former classes of explosives, and also any star and any coloured fire composition, subject to the proviso to the definition of manufactured fireworks.

Nil.

DIVISION 2.—MANUFACTURED FIREWORKS.

MANUFACTURED FIREWORKS, consisting of any explosive of the classes 1, 2, 3, 4 and 6 and any firework composition, when such explosive or composition is enclosed in any case or contrivance or is otherwise manufactured so as to form a squib, cracker, toy cap or amorce, serpent, rocket (other than a war-rocket), maroon, lance, wheel, Chinese fire, Roman candle, or other article specially adapted for the production of pyrotechnic effects, or pyrotechnic signals, or sound signals:

Provided that a substantially constructed and hermetically closed metal case, containing not more than one pound of coloured fire composition of such a nature as not to be liable to spontaneous ignition shall be deemed to be a "manufactured firework" and not a "firework composition."

Aluminium or Magnesium Torches.

Amorces.

Chinese Crackers.

Light Signals.

Magnesium or Aluminium Torches.

Manufactured Fireworks.

Pyrotechnic Matches.

Rockets.

Sparklers.

N. L. SHELDON,
Chief Inspector of Explosives, India.

APPENDIX F.

**List of non-dangerous petroleum installations licensed during the year 1921.*

Presidency or Province.	District.	No.	Presidency or Province.	District.	No.
Ajmer-Merwara	Ajmer	3	Bihar and Orissa	Balasore	5
				Bhagalpur	6
	TOTAL	3		Champan	5
Assam	Cachar	3		Cuttack	4
	Darrang	1		Darbhanga	3
	Goalpara	7		Gaya	6
	Kamrup	2		Manbhum	13
	Lakhimpur	2		Monghyr	3
	Nowgong	2		Muzaffarpur	9
	Sibsagar	7		Palamau	3
	TOTAL	24		Patna	6
Baluchistan	Quetta	3		Puri	1
				Purnea	9
	TOTAL	3		Ranchi	2
Bengal	Backerganj	6		Sambalpur	7
	Bankura	3		Saran	2
	Bogra	4		Shahabad	3
	Birbhum	1		Singbhum	3
	Burdwan	0		Sonthal Parganas	8
	Calcutta	0		TOTAL	59
	Chittagong	3	Bombay	Ahmedabad	7
	Darjeeling	3		Ahmednagar	3
	Dinajpur	3		Belgaum	7
	Hooghly	1		Bijapur	6
	Howrah	6		Bombay	14
	Jalpaiguri	5		Breach	19
	Khulna	6		Dharwar	12
	Midnapur	2		Hyderabad (Sind)	3
	Murshidabad	9		Kaira	1
	Nadia	7		Karachi	12
	Pabna	1		East Khandesh	4
	Rajshahi	3		West Khandesh	1
	Rangpur	8		Kolhapur	1
	24-Parganas	9		Nasik	1
	TOTAL	95		Poona	1
				Satara	1
				Sholapur	1
				Surat	1
				Thane	1
				TOTAL	1

* This list includes godowns for the storage of non-dangerous petroleum regarding which this Department cognizance.

APPENDIX F—contd.

*List of non-dangerous petroleum installations licensed during the year 1921—contd.

Presidency or Province	District.	No.	Presidency or Province.	District.	No.
Burma	Bassein . . .	1	Madras	Anantapur . . .	5
	Bhamo . . .	1		Bellary . . .	6
	Mandalay . . .	6		Chingleput . . .	0
	Mergui . . .	1		Chittoor . . .	3
	Munba . . .	1		Coimbatore . . .	7
	Myingyan . . .	2		Cuddapah . . .	2
	Northern Shan States.	3		Ganjam . . .	7
	Prome . . .	2		Godavari . . .	6
	Rangoon . . .	1		Guntur . . .	12
	Tavoy . . .	1		Kistna . . .	17
	Thaton . . .	1		Kurnool . . .	4
	TOTAL	20		Madras . . .	6
Central Provinces	Alola . . .	7		Madura . . .	7
	Amraoti . . .	8		Malabar . . .	14
	Bhandara . . .	7		Nellore . . .	3
	Bilaspur . . .	4		North Arcot . . .	13
	Buldana . . .	9		Ramnad . . .	10
	Chanda . . .	4		Salem . . .	3
	Chhindwara . . .	4		South Arcot . . .	16
	Damoh . . .	14		South Canara . . .	5
	Hoshangabad . . .	7		Tanjore . . .	21
	Jubbulpore . . .	7		Tinnevely . . .	6
	Nagpur . . .	8		Trichinopoly . . .	8
	Narsingpur . . .	3		Vizagapatam . . .	8
	Nimar (Khandwa) . . .	8		TOTAL	201
	Raipur . . .	6	Mysore . . .	Bangalore . . .	13
	Saugor . . .	4		TOTAL	13
	Wardha . . .	11			
	TOTAL	101	North-West Frontier Province.	Harazai . . .	2
Delhi	Delhi . . .	7		Peshawar . . .	10
	TOTAL	7		TOTAL	12
Hyderabad	Hyderabad . . .	17		Ambala . . .	13
	Secunderabad . . .	3		Amritsar . . .	5
	TOTAL	20		Attock . . .	1
Jaipur	Jaipur . . .	1		Ferozepur . . .	2
	TOTAL	1		Gujranwala . . .	1
				Gurdaspur . . .	2
				Hoshiarpur . . .	3
				Carried over	27

* This list includes godowns for the storage of non-dangerous petroleum regarding which this Department has cognizance.

APPENDIX F—concl'd.

*List of non-dangerous petroleum installations licensed during the year 1921—continued.

Presidency or Province.	District.	No.	Presidency or Province.	District.	No.
Punjab	Brought forward	27	United Provinces	Brought forward	25
	Jullundur	3		Basti	7
	Lahore	4		Benares	6
	Ludhiana	6		Bijnor	6
	Lyalpur	2		Cawnpore	3
	Multan	2		Dehra Dun	1
	Rawalpindi	3		Etawah	3
	Shahpur	4		Fyzabad	5
	Sialkot	4		Ghazipur	2
	TOTAL	55		Gonda	2
United Provinces	Agra	5	United Provinces	Gerakhpur	4
	Aligarh	2		Jaunpur	1
	Allahabad	6		Jhansi	3
	Azamgarh	3		Lucknow	2
	Bahraich	3		Meerut	4
	Ballia	1		Moradabad	3
	Bara Banki	1		Muttra	3
	Barcilly	4		Partabgarh	2
	Carried over	25		Saharanpur	5
				Shahjahanpur	3
				TOTAL	90

*This list includes godowns for the storage of non-dangerous petroleum regarding which this Department has cognizance.

SUMMARY.

Presidency or Province.	No.
Ajmer-Merwara	3
Assam	24
Baluchistan	3
Bengal	95
Bihar and Orissa	99
Bombay	122
Burma	20
Central Provinces	101
Delhi	7
Hyderabad	20
Jaipur	1
Madras	201
Mysore	13
North-West Frontier Province	12
Punjab	55
United Provinces	90
TOTAL	866

APPENDIX G.

Summary of non-dangerous petroleum installations and godowns licensed for the ten years ending 1921.

Presidency or Province.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
Ajmer-Merwara	4	4	4	4	4	4	4	4	3	3
Assam	3	5	5	5	6	13	16	17	23	24
Baluchistan	2	3	3	3	3	3	3	3	3	3
Bengal	69	73	71	69	74	77	70	77	77	65
Bihar and Orissa	67	67	68	70	73	70	83	87	95	99
Bombay	80	88	94	99	102	100	111	114	126	122
Burma	41	40	53	58	64	70	77	81	22	20
Central Provinces	81	80	83	84	88	86	90	89	100	101
Delhi		6	7	7	7	7	7	7	7	7
Hyderabad	12	14	14	17	18	20	20	20	20	20
Jaipur										1
Madras	138	151	167	173	170	190	194	191	199	201
Mysore	10	11	11	12	12	12	13	13	13	13
North-West Frontier Province.	7	7	6	6	6	11	12	12	12	12
Punjab	39	34	35	38	30	46	50	52	54	55
United Provinces	71	79	82	87	90	89	87	87	88	90
TOTAL	630	668	703	730	765	812	846	854	842	866

APPENDIX H.

Statement showing the quantity of petroleum imported by sea into British India during the ten years ending 1921.

Non-Dangerous Petroleum.

Port or Province.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Chittagong	9,250,508	9,927,422	9,626,242	10,674,018	10,450,117	11,919,028	13,351,240	13,413,870	13,019,301	10,474,424
Cuttack	250,600	306,000	386,000	270,752	319,500	303,000	193,320	222,764	82,361	134,502
Calcutta	26,469,283	28,720,828	39,003,610	29,221,867	20,978,680	14,012,107	8,812,381	38,015,865	30,500,698	24,822,163
Bombay	22,700,826	46,615,625	26,722,382	22,820,980	23,343,109	22,288,703	23,158,591	40,365,236	30,620,238	42,802,182
Sind	7,274,002	10,013,206	11,570,007	8,991,297	4,610,540	7,005,011	4,177,590	8,823,037	10,000,235	6,062,923
Madras	10,625,192	12,408,817	15,559,316	14,655,748	14,413,000	6,007,818	2,154,482	13,662,188	17,253,505	8,140,755
Burma	1,018,526	1,146,067	1,036,077	1,006,000	582,277	22,221	617,368	204,650	728,030	297,214
TOTAL	77,684,829	109,167,035	105,058,621	87,715,787	88,610,741	63,223,041	68,475,072	122,827,560	110,210,471	91,174,277

APPENDIX H—*contd.*

Statement showing the quantity of petroleum imported by sea into British India during the ten years ending 1921—contd.

Dangerous Petroleum.

Port or Province.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Calcutta	..	..	..	..	..	..	..	290	400	..
Chittagong	..	..	..	..	..	..	24,196	10,682	40,760	65,801
Cochin	22,080	340	482	2,110	29,016	..	62,159	8,335	2,803	8,121
Bombay	169,522	772,666	490,000	48,000	12,008	140,948	..	40	..	8
Rangoon	6,185	8,574	1,514	4,031	2,250	..	..	..	48	..
Madras	4,120	..	..	4	..	221,690	..	12,000	108	1,010
Burma	420	210	20	..	1,000	116	20	31	23	189
Total	512,937	781,829	50,006	54,739	44,214	565,674	76,475	87,511	45,148	65,807

Statement showing the quantity of petroleum produced in Burma and transported into British India during the ten years ending 1921.

	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Non-dangerous petroleum	200,152,787	23,581,833	106,601,715	106,720,414	111,031,572	112,31,410	119,561,906	101,053,405	113,872,624	117,020,071
Dangerous petroleum	1,592,610	2,442,242	3,731,374	8,717,201	5,903,123	5,811,061	5,382,723	6,700,479	16,456,783	15,005,173

Statement showing the quantity of petroleum produced in Assam and Burma during the ten years ending 1921.

Non-Dangerous Petroleum.

Province.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Assam	1,905,935	2,539,009	2,975,870	2,831,455	7,000,708	5,712,001	8,670,752	9,609,074	11,061,143	9,530,924
Burma	101,250,234	181,010,944	178,215,761	171,003,827	176,109,400	175,707,512	178,021,875	170,144,784	165,611,476	168,167,127
Total	103,156,169	183,550,953	181,291,631	173,835,282	183,119,108	181,419,513	186,692,627	179,754,858	176,672,620	177,718,101

Dangerous Petroleum.

Province.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Assam	120,015	179,776	217,875	210,213	208,078	401,947	419,737	415,155	447,154	27,771
Burma	23,109,293	32,375,142	32,281,814	30,129,420	33,159,701	32,435,711	33,075,895	33,524,958	30,231,332	37,754
Total	23,229,308	32,554,918	32,499,689	30,339,633	33,367,779	32,837,658	33,495,632	33,940,113	30,702,506	37,825

APPENDIX I.

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1921 to 31st December 1921.

Explosives.

No.	Date of accident.	Nature of Explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	NUMBER OF PERSONS	
					Killed.	Injured.
1	9th January 1921.	Gunpowder	Basim District, Akola.	One Krishanji Dawji Mali of Kaka-datti purchased some blasting powder and afterwards went to a blacksmith's shop at Basim where a spark exploded the powder severely injuring him. He died on the 10th instant.	1	...
2	31st January 1921.	Ditto	Nawaghat p o t, Saloni.	The powder which was being pounded in a stone mortar with a wooden pestle suddenly caught fire and 3 persons were injured.	3	...
3	15th May 1921.	Ditto	Basim, Akola.	4 persons were deepening a well, 3 were inside the well where a hole was made in the rock. A tube filled with gunpowder was inserted in it but as the hole was not big enough one of them hammered the tube in with a stone with the result that the gunpowder in the tube exploded and two men were injured. One of them died 10 days after.	1	1
4	17th June 1921.	Ditto	Ditto	One person engaged in deepening a well returned home with a piece of fuse and ten tolas of blasting powder in a tin on the 16th June 1921. Next morning while he and his 3 sons were sitting near a fire owing to cold, the clothes of one of them caught fire and while extinguishing the flames a spark fell on the gunpowder and caused an explosion with the result that 4 of them were injured. One of them died afterwards.	1	3
5	23rd June 1921.	Ditto	Bombay	When blasting operations were being carried out in a quarry near Sandhurst Road, a stone weighing about 171 lbs. flew a distance of 350 feet and killed a person seated on the staircase of a building.	1	...
TOTAL					7	4
6	22nd July 1921.	Cordite	Kirkee Arsenal	During the destruction of cordite by burning, apparently due to premature ignition, one British Rank and seventeen Indian other ranks were injured, three of the Indian other ranks subsequently succumbed to their injuries.	3	16
TOTAL					3	18
7	20th October 1921.	Fulminate	Kattimedu, Tanjore.	Four persons were injured while preparing "Vengaya vedis" a kind of fireworks in which chlorate of potash and red sulphide of arsenic were used. One of them died later.	1	3
8	27th October 1921.	Fulminate	Aryavattam, Godavari.	Two men purchased potassium chlorate and sulphide of arsenic. While one of them was making crackers with a mixture of these two, one of them exploded with the result that the remaining mixture and crackers lying near by also took fire and exploded. The man's chest, legs and hands were scorched.	...	1

APPENDIX I—contd.

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1921 to 31st December 1921—contd.

Explosives—contd.

No.	Date of accident.	Nature of Explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	NUMBER OF PERSONS	
					Killed.	Injured.
9	29th October 1921.	Fulminate	Gollapalle m, Godavari.	While a man was pounding with a stone, potassium chlorate, sulphur and charcoal in an earthenware basin the mixture exploded, his face and hands being scorched.	...	1
10	6th December 1921.	Ditto	Tinnorelly	A man was grinding the ingredients of a fulminate together in a stone mortar when an explosion occurred fatally injuring him and causing slight injuries to another man.	1	1
TOTAL					2	0
11	20th January 1921.	Detonators Gunpowder, etc.	Bangalore	While some time old explosives were being destroyed, an explosion occurred in which a Quarter Master Sergeant was killed and 3 men were injured.	1	3
TOTAL					1	3
12	26th April 1921.	Fireworks	Calcutta	Three men were preparing fireworks in the house of another dealer and fell asleep in the same room where a hanging kerosene oil lamp was burning. The lamp was blown down on the floor by a gust of wind resulting in the explosion of fireworks and the three men were badly burnt, one of whom expired shortly after his removal to hospital.	1	2
13	14th June 1921.	Bomb	Landi Kolai	During firing practice of a Stokes mortar, a bomb detonated with fuse percussion spigot No. 116 Mark IV exploded prematurely with the result that one officer was killed and seven of other ranks wounded.	1	7
14	27th September 1921.	Ditto	Ditto	A lad about 10 years had prepared a "Chabi Bari" by filling the hole of a large and rusty key with some explosive material which on being struck against some hard substance an explosion occurred and he sustained severe injuries to which he succumbed.	1	...
15	23rd October 1921.	Ditto	Ditto	A fire broke out in a shop at No. 9, Upper Circular Road, which was licensed for the storage and sale of manufactured fireworks, resulting in the death of 3 Mahomedans. The cause of the fire is unknown but it is believed, some fireworks were being manufactured behind the shop.	3	...
16	December 1921	Fireworks	Tinnorelly	An explosion took place in the lower room of a house where 5,000 crackers tied up in a gunny bag were kept by the owner of an adjacent shop who held a license. One man was killed, and it is presumed that he must have been smoking and a lighted match or sparks fell on the bag.	1	...

APPENDIX I—contd.

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1921 to 31st December 1921—concl'd.

Explosives—concl'd.

No.	Date of accident.	Nature of Explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	NUMBER OF PERSONS	
					Killed.	Injured.
17	21st December 1921.	Fireworks	Bombay	A blacksmith picked up a Very Signal Cartridge which was lying on the deck of a ship and struck it with a hammer, when it exploded. The man received skin deep wounds all over the right side of his body and the finger tips of his left hand were blown off. Another man who was standing near by sustained small skin deep wounds on his chest.	...	2
TOTAL					7	11

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1921 to 31st December 1921.

Petroleum.

No.	Date of accident.	Nature of Oil.	Where accident occurred.	Circumstances of accident so far as ascertained.	NUMBER OF PERSONS	
					Killed.	Injured.
18	17th January 1921.	Naphtha	Soilgyi refinery, Burma.	A fire broke out in the extractor house in the Indo-Burma Petroleum Company's refinery where bauxite was being purified with Naphtha, resulting in the death of 4 persons. The cause of the fire was probably the use of electric hand lamps in an area where benzine fumes were present.	4	...
19	1st February 1921.	Kerosine oil	Bombay	Whilst a barber aged 25 years was pumping air into a primus stove which was alight, the oil caught the flame and set his clothes on fire. He was burnt on the chest, stomach and legs.	...	1
20	8th February 1921.	Ditto	Ditto	In a hut, a kerosine oil lamp was left burning and it is surmised that the son of the owner aged 8 years accidentally upset it and caused a fire which spread to the 14 adjoining huts which were all destroyed.	...	...
21	10th February 1921.	Petrol	Ditto	Two khalasies died of burns received from petrol catching fire on the motor launch "Santos." The two deceased went into the engine pit with a hurricane lantern after having broken open the hatch cover presumably with intention to pillar petrol.	2	...
22	9th March 1921.	Ditto	Ditto	A motor driver in the employ of Messrs. Strass & Co., was attending to a defect in the petrol cock with the aid of a covered acetylene lamp. Some petrol caught fire and the wood work, etc., of the car was burnt. The driver in trying to extinguish the fire received burns on his hands, arms and face.	...	1
23	29th May 1921.	Ditto	Bollary	Owing to careless marshalling, a wagon loaded with petrol and placed next to the engine caught fire while the engine was taking water from a water column. The pumper and his son were seriously injured by the bursting of petrol drums.	...	2

APPENDIX I—concl'd.

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1921 to 31st December 1921—concl'd.

Petroleum—concl'd.

No.	Date of accident.	Nature of Oil.	Where accident occurred.	Circumstances of accident so far as ascertained.	NUMBER OF PERSONS.	
					Killed.	Injured.
24	30th June 1921.	Petroleum	Syriam, Burma	A fire occurred at No 10 bench at the Burma Oil Company's refinery at Syriam owing to the bursting of one end of a probeater still due to carelessness in not opening the delivery valve and in allowing the bye pass on the pump to get out of order.	2	16
25	9th July 1921.	Ditto	Bombay	A man said to have been not in his right mind went into the inner room of a house and in about 10 minutes time a fire broke out in that room.	...	...
26	23rd December 1921.	Petrol	Rangoon	A fire broke out in a two storied house in Tsee Kai Maung Tawlay Street. Three motor cars were burnt, a horse burnt to death and three office carriages severely damaged. The flooring and all internal wood work of the building were almost destroyed and a man occupying the upper floor of the building lost his clothes and furniture. A driver of one of the cars was very badly burnt. The cause of the fire is due to a naked Petroleum lamp being kept near one of the motor cars from which vapour or petrol must have escaped.	...	1
TOTAL					8	20

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1921 to 31st December 1921.

Miscellaneous.

No.	Date of accident.	Nature of Substance.	Where accident occurred.	Circumstances of accident so far as ascertained.	NUMBER OF PERSONS.	
					Killed.	Injured.
27	11th January 1921.	Matches	Corn a u g h t Road, Bombay.	A boy aged 1 year when playing with a box of matches accidentally set fire to his clothes with the result that he received burns on the face, etc. He was removed to a hospital for treatment where he subsequently died.	1	...
28	26th April 1921.	Ditto	Kamathpura, Bombay.	A boy while attempting to light a fire, on striking a match his clothes caught fire. His mother in trying to tear off the clothes also received burns.	2	...
29	6th May 1921.	Carbonic acid Gas cylinder.	Bare Street, Rangoon.	Two men were engaged in cutting a cylinder with a pipe cutting instrument, when suddenly an explosion occurred, one man injured the two men and the other struck a lad who was walking past the shop at the time and killed him instantly.	1	...
TOTAL					4	...

APPENDIX J.

Summary of accidents during the year 1921.

Explosives or dangerous and inflammable substances.	ACCIDENTS CAUSING LOSS OF LIFE AND BODILY INJURY.			Accidents not causing loss of life or bodily injury.	Total number of accidents.
	Number of accidents.	NUMBER OF PERSONS			
		Killed.	Injured.		
<i>Explosives.</i>					
Gunpowder	5	7	4	...	5
Nitro-compounds	1	3	15	...	1
Fulminates	4	2	6	...	4
Ammunition	1	1	3	...	1
Fireworks	6	7	11	...	6
TOTAL	17	20	39	...	17
<i>Petroleum.</i>					
Petroleum generally	7	8	20	2	9
TOTAL	7	8	20	2	9
Chemicals . . . . .	...	...	...	...	...
TOTAL . . . . .	...	...	...	...	...
Miscellaneous	3	4	2	...	3
TOTAL	3	4	2	...	3
GRAND TOTAL	27	32	61	2	29

APPENDIX K.

Detailed statement showing the number of accidents and persons killed and injured during the ten years ending 1921.

Year.	GUNPOWDER			DYNAMITE AND OTHER NITRO COMPOUND BLASTING EXPLOSIVES			FULMINATES			AMMUNITION			FIREWORKS		
	Number of accidents	Persons killed	Persons injured	Number of accidents	Persons killed	Persons injured	Number of accidents	Persons killed	Persons injured	Number of accidents	Persons killed	Persons injured	Number of accidents	Persons killed	Persons injured
1912	10	13	6	6	5	35	..	..	..	1	..	1	12	4	16
1913	15	12	25	3	2	1	..	..	..	1	..	1	14	14	26
1914	8	6	7	3	..	5	..	..	..	..	..	..	6	5	21
1915	2	2	2	2	2	..	1	..	1	1	..	1	4	2	3
1916	3	3	3	..	..	..	1	..	1	..	..	..	1	..	1
1917	0	0	7	1	..	1	..	..	..	5	..	5	1	1	..
1918	4	12	5	4	1	8	..	..	..	4	4	3	1	1	..
1919	5	8	16	4	1	9	..	..	..	..	..	..	4	1	18
1920	6	4	11	..	..	..	3	9	21	6	1	9	2	4	1
1921	5	7	4	1	3	16	4	2	6	1	1	3	6	7	11
TOTAL	66	75	87	23	14	74	9	11	30	19	6	23	51	39	97
AVERAGE	7	7	9	2	1	7	1	1	3	2	1	2	5	4	9

APPENDIX K—contd.

Detailed statement showing the number of accidents and persons killed and injured during the ten years ending 1921.

Year.	PETROLEUM.			CHEMICALS.			MISCELLANEOUS.		
	Number of accidents.	Persons killed.	Persons injured.	Number of accidents.	Persons killed.	Persons injured.	Number of accidents.	Persons killed.	Persons injured.
1912	17	25	12	2	...	1	1	1	1
1913	12	10	10	...	...	...	2	...	3
1914	9	11	9	...	...	...	1	1	...
1915	15	17	32	...	...	...	...	...	...
1916	11	21	9	2	1	3	1	2	...
1917	8	4	7	...	...	...	6	5	20
1918	13	26	17	2	1	5	4	1	1
1919	12	15	50	1	5	...	3	2	2
1920	22	7	14	1	1	8	...	...	...
1921	7	8	20	...	...	...	3	4	2
TOTAL	126	153	180	8	8	17	21	16	20
AVERAGE	13	15	18	1	1	2	2	2	3

APPENDIX L.

Comparative statement showing the number of accidents and persons killed and injured during the ten years ending 1921.

Comparative statement showing the number of accidents during the ten years ending 1921.					
Year.	ACCIDENTS CAUSING LOSS OF LIFE OR BODILY INJURY.			Accidents not causing loss of life or bodily injury.	Total number of accidents.
	Number of accidents.	NUMBER OF PERSONS			
		Killed	Injured.		
1912	44	48	72	4	48
1913	40	47	75	1	47
1914	27	23	42	...	27
1915	25	23	40	2	27
1916	10	25	17	2	21
1917	27	19	40	...	27
1918	29	46	30	3	32
1919	23	32	95	6	29
1920	32	20	64	10	42
1921	27	32	61	2	29
TOTAL	209	322	541	30	320
AVERAGE	20	32	54	3	32

APPENDIX M.

Special License to possess dangerous petroleum in one receptacle containing more than sixty-five gallons:

(Rule 6, Chapter IV of Part II.)

No.

Fee Rs.

License is hereby granted to _____ for the storage
in the licensed premises described below of _____ gallons of dangerous petroleum
in one tank subject to the rules for the storage of petroleum published in notification No. _____
dated _____ and to the further conditions attached hereto.

The _____ 19____

Secretary to The Government of _____

[Description of the licensed premises above referred to.]

The licensed premises are situated _____ and
consist of a gas tight tank of a capacity of _____ gallons sunk under-
ground.

Conditions of license.

1. The petroleum shall be stored in one gas tight metal tank of a capacity of _____ gallons sunk completely underground in the position shown on plan submitted; and placed in a pit lined with concrete or brick in cement, the tank being packed round with sand, earth or clay so that no air space is left below ground level and the tank is not visible.
2. A pump or pumps shall be placed in the position shown on plan submitted, the pipe connection between the tank and the pump or pumps shall be placed underground and all joints, valves and cocks shall be gas tight.
3. For the purpose of charging the tanks of locomotives the petroleum shall be—
 - (a) Pumped through strong metal piping by means of approved pumps into above-ground measuring tanks of a capacity not exceeding 30 gallons, fixed in approved positions, and run thence through sound hose, fitted with secure self closing cock and nozzle, into the tanks of locomotives, or
 - (b) Pumped through strong metal piping by means of approved pumps into an above-ground service tank of approved capacity, fixed in an approved position, and run thence through strong metal piping into measuring tanks of a capacity not exceeding 30 gallons fixed in approved positions and thence through sound hose, fitted with secure self closing cock and nozzle, into the tanks of locomotives, or
 - (c) Pumped by means of approved measuring pumps, fixed in approved positions, through sound hose fitted with secure tap and nozzle, into the tanks of locomotives.
4. All tanks, pumps, pipes and fittings shall be strongly constructed of the best material.
5. All service or measuring tanks shall be fitted with overflow and emptying pipes returning to the storage tank.
6. The petroleum shall enter the tank "under seal" and all tanks shall be fitted with a vent pipe leading into the open air, the open end being covered with brass gauze 32 mesh and fitted with a hood or the open end shall be fitted with a inlet valve and an exhaust valve.
7. If the licensing officer call upon the holder of a license by a notice in writing, to execute any repairs to the storage premises, which may, in the opinion of such officer be necessary for

the safety of the said premises, the holder of the license shall execute the repairs within such period, not being less than one month from the date of receipt of the notice as may be fixed by the notice.

8. The tank before being repaired, shall be cleared of all dangerous petroleum and of all dangerous vapours arising from the same.

9. The license holder is prohibited from delivering any quantity of dangerous petroleum exceeding three gallons to any one who has not a license under section 5 or section 6 of the Act.

10. All due precautions shall be taken for the prevention of unauthorised persons having access to any petroleum kept and to the vessels containing or having actually contained the same.

11. Every person managing or employed on or in connection with the storage premises shall abstain from any act whatever which tends to cause fire or explosion and which is not reasonably necessary, and shall prevent any other person from doing such act.

12. The storage premises shall be liable to inspection by an officer not being of lower rank than a Sub-Inspector of Police authorised by the Local Government in this behalf.

APPENDIX N.

Explosives accident near Howrah Bridge.

Explosives for Calcutta and the north of India are imported by sea and are either landed at the Port Commissioners' magazine at Moyapur, 25 miles below Fort William, or are transhipped at Moyapur or Diamond Harbour into barges. Blasting explosives are not landed at Moyapur. The explosives in the Moyapur magazine and in the barges were, up to the time of this accident, distributed by the various owners concerned, either :—

- (a) by rail from Diamond Harbour,
- (b) by barge and rail from Bowbazar railway siding,
- (c) by barge through the Port of Calcutta to Bally railway station,
- (d) by barge through the Port of Calcutta to the Bally magazines situated on the Bally Khal one and a quarter miles above Bally railway station,
- (e) in small quantities of explosives, not being blasting explosives, in lots of 500 lbs. or less direct by barge to Prinsep's Ghat at Calcutta.

II. Consignments of high explosives belonging to Messrs. Gillanders, Arbuthnot and Company were mostly transported by barge from Moyapur direct to their magazine at Bally. The actual transport was undertaken by the Calcutta Landing and Shipping Company whose Agents are Messrs Gladstone, Wyllie and Company. The barges were towed by a steam launch from Moyapur through the Port of Calcutta, underneath Howrah Bridge and up the river to the mouth of the Bally Khal. From that point they were poled up the canal to the magazines at Bally.

III. Rule 35 of Government of Bengal, Marine Department, Notification No. 92 Marine, dated 28th July 1919, for the Port of Calcutta lays down that no steam vessel shall pass through any bridge opening with the tide with more than two cargo boats astern and under rule 21 of Marine Department Notification No. 69 Marine, dated 1st July 1918, publishing rules for the transport and importation of explosives, explosives shall only be allowed to enter and pass through the port under supervision of the police.

IV. On Wednesday 11th May 1921, seven barges laden with explosives were being towed astern from Moyapur to Bally by the launch "Viking" belonging to the Calcutta Landing and Shipping Company. They attempted to pass under the bridge with the tide. The total quantity of explosives in the seven barges was—

1,600 cases of	50 lbs. each	Dynamite.
500 " "	50 " "	Gelignite.
300 " "	50 " "	Gelatine Dynamite.
80 " "	50 " "	Viking Powder.
40 " "	10,000	Detonators.
100 " "	5,000	Detonators.
160 " "	500	Electric Detonators.
15 " "	1,000	Electric Detonators.
80 " "	500	Submarine electric Detonators.

The 2,480 cases of Nitro-Compound explosives were loaded into six cargo boats and the Detonators into one cargo boat.

V. The accident can best be described by quoting the protest signed by the boatman in charge of the cargo boat which collided with Howrah Bridge and sank.

I, *Shaik Kāro*; son of *Shaik Panchu*, deceased, by caste Mahomedan, residing in the village of *Surajgarha*, *Thana Surajgarha* in the District of *Monghyr*, do hereby solemnly declare and say as follows :—

1. That I am a Manjee or Head Boatman and have been working on the river Hooghly in and about the Port of Calcutta for about 20 years and at present am employed as a Manjee or Head Boatman in Messrs. G. M. & G. Sabar and Company's Boat No. 21 Branded No. A-525.
2. That on the 9th May 1921, my boat was taken on hire by the Calcutta Landing and Shipping Company, Limited, and was duly surveyed by the Port Commissioners' Surveyor for carrying explosives and obtained license for the same.
3. That on the evening of the 9th May instant my boat was towed to Moyapur along with the other boats by one of the Calcutta Landing and Shipping Company, Limited's Steam Launches and placed alongside the S.S. "Clan Sinclair" lying at Moyapur aforesaid for the purpose of receiving explosives from the said steamship.
4. That on the following day the 10th instant at about 12 noon my boat was loaded with 450 cases of explosives ex the said S.S. "Clan Sinclair" on account of Nobel's Explosives Limited, Managing Agents, Messrs. Gillanders, Arbuthnot and Company with instructions to proceed to Bally Khal for discharge.
5. That on the following day the 11th instant my boat was towed back to Calcutta by one of the Calcutta Landing and Shipping Company, Limited's Steam Launches and arrived off the Bridge Howrah at about 2 P.M. on that day. There was a strong flood running at the time and the Launch turned to stem it in order to drop us through the Bridge. In dropping through, my Boat was caught by the strong tide and swung broad side on causing it to collide with one of the Horns of the Bridge pontoons and my side planks were staved in. Immediately I saw my boat was seriously damaged and making water and I at once made for the foreshore of Howrah near Jessop and Company's Yard where I beached my boat which was by this time half full of water. I then reported the accident to one of the Calcutta Landing and Shipping Company's Sahibs who immediately took action and placed another empty boat alongside mine and the said Messrs. Gillanders, Arbuthnot and Company, Managing Agents of Nobel's Explosives, had my cargo transferred to the empty boat, my cargo then being wet with water, my boat being at this time entirely submerged.
6. That my said boat is a wooden built one of 25 tons burthen and from the time of loading up to the time of the accident she was water tight and staunch with a complete crew of six men on board.

VI. The barge No. A-525 which was beached in front of Messrs. Jessop and Company's yard was now completely under water. It contained the following explosives :—

- 447 cases Dynamite at 50 lbs. each,
- 2 cases Gelignite,
- 1 case Gelatine Dynamite,

or a total of 10 tons 100 lbs.

Only a few of the cases were floating on the surface of the water inside the barge. Mr. Gobin Chand Dey, Store-keeper of the Bally Magazine, who was on the launch at the time of the accident, reported the matter to Mr. W. F. Tuckett of Messrs. Gillanders, Arbuthnot and Company. Mr. Tuckett ordered that the cases were to be unloaded as soon as the tide went down into another empty barge No. G. M. 13 sent for the purpose. The work of unloading the cases commenced at about 7-30 P.M. and was completed at 11-30 P.M. The cases were therefore under water for over four hours. At 3-30 A.M. the barge now containing the explosives was towed by a launch to Bally Khal and at 5 A.M. reached a spot near Bally Railway Station. Both the damaged barge and the barge containing the explosives were not the property of the Calcutta Landing and Shipping Company but were only hired.

VII. On Thursday 12th May at about 12 o'clock the accident was reported to me by Mr. Tuckett and I immediately proceeded with him to Howrah and inspected the sunken barge. There was a hole in its starboard side about 2 feet by 5 feet. There was at the time about a foot of water and mud inside the barge. As the tide had gone down, I examined the mud for Nitro-glycerine but could not detect any. I stopped all work on repairing the barge pending further orders.

VIII. At 2-30 P.M. the same day I proceeded together with Mr. Tuckett to Bally Railway Station and inspected the barge of wet explosives. I found the barge lying near the Railway Bridge over which engines were passing every few minutes. I took off the hatches and entered

the barge. The cases inside the barge were not stacked in piles but were lying about anyway. The majority of them were saturated outside with an oil. I dipped a piece of blotting paper in the oil outside one of the cases and another piece in the oil on the deck and took them on shore and tested them with a lighted match. Both pieces burnt off rapidly in the way characteristic of nitro-glycerine. I took one case on shore and opened it and found that the cartridges had exuded nitro-glycerine to such an extent that the case contained pools of nitro-glycerine both inside and outside the waterproof wrapping. The cartridges had also lost their usual shape due to loss of nitro-glycerine. I returned the case to the barge and examined several others and came to the conclusion that they were all in an extremely dangerous condition. Samples of the cartridges were forwarded to the Chemical Examiner who reported that in some cases the nitro-glycerine had been completely displaced and in all other cases only traces of nitro-glycerine remained. I dipped a rod into the liquid lying in the bilges of the barge and found that it consisted of a layer of rather more than three inches of nitro-glycerine. As the cases were not stacked but were lying in tangled heaps and as the bilge pump was also full of nitro-glycerine, I came to the conclusion that any attempt to unload the barge, bale out the nitro-glycerine and clear the barge was a far too dangerous proceeding to be permitted. This meant that the whole would have to be destroyed together.

IX. There were the following methods available for the destruction :—

- (1) Explode the barge up the Bally Khal,
- (2) Take it to the mouth of the Khal and sink her,
- (3) Tow the barge through the Port of Calcutta and either sink her or explode her at the mouth of the Hooghly,
- (4) Tow the barge up the river and either sink or sink and explode her.

X. Mr. Tuckett and I examined the Bally Khal for some distance up but could find no spot where the destruction could be undertaken with safety. There was no spot free of dwelling houses or factories or railways and there were the four big magazines at Bally itself which had to be considered. I, therefore, ordered the barge out of the canal into the Hooghly and had her anchored at the mouth of the canal. The crew were taken off and a police guard stationed on the bank near by. It was after dark before this work could be completed.

XI. At 11 A.M. on Friday 13th I called a meeting in my office and the following attended :—

N. L. Sheldon, Esq., Ph D., F.I.C., Chief Inspector of Explosives in India
 S. C. Stuart-Williams, Esq., Vice-Chairman, Calcutta Port Commissioners,
 Commander E. A. Constable, Deputy Conservator of the Port.
 F. D. Bartley, Esq., Deputy Commissioner, Port Police, Calcutta.
 W. Cook, Esq., Assistant ditto ditto.
 A. C. Gladstone, Esq., Messrs. Gillanders, Arbuthnot & Co.
 W. F. Tuckett, Esq., ditto ditto.
 H. C. Burke, Esq., Messrs. Gladstone, Wyllie & Co.
 C. Kendrick, Esq., ditto ditto.

At this meeting it was decided that it was too dangerous to allow the barge containing the damaged explosives to be towed through the Port of Calcutta and that the explosives must be destroyed and not sunk anywhere to be a continual future danger. Also that the barge should not be destroyed near Bally Khal but be taken up the river for destruction. It was also decided that the damaged barge lying near Howrah Bridge should be refloated and if, after inspection, it was found to be free of nitro-glycerine that it should be liberated for repair and use.

XII. A meeting was held the same day Friday, 13th May, by Sir Henry Wheeler in his office, at which the following attended :—

Sir Henry Wheeler.
 R. Clarke, Esq., Commissioner of Police, Calcutta.
 N. L. Sheldon, Esq., Chief Inspector of Explosives in India.
 S. C. Stuart-Williams, Esq., Vice-Chairman, Calcutta Port Commissioners.
 B. E. Eddis, Esq. Messrs. Gillanders, Arbuthnot & Co.
 H. C. Burke, Esq. Messrs. Gladstone, Wyllie & Co.
 C. Kendrick, Esq. ditto ditto.

The decisions arrived at by the meeting held in my office that morning were approved. Neither firm, Messrs. Gillanders, Arbuthnot & Co., nor Messrs. Gladstone, Wyllie & Co. appeared willing to accept any responsibility in the matter so that it was found necessary to

apply for an order on Messrs. Gladstone, Wyllie and Co., to remove the barge to a safe place up the river. This order was issued on Saturday 14th May by the Chief Presidency Magistrate, Calcutta.

XIII. On Saturday 14th May I started up the river by launch together with Commander Constable, Deputy Conservator of the Port, and Mr. Tuckett of Messrs. Gillanders, Arbuthnot and Company. I found that the damaged barge No. A-525 lying at the Bridge had been removed as arranged and after repair was passed by me a few days later for use, and is now again in commission. I inspected the barge No. G.M.-13 containing the damaged dynamite lying in the Hooghly at the Khal. As arranged, the barge was guarded by Police on shore and by a Police launch. I then proceeded up the river to search for a place free from all houses, etc., and at 11 A.M. the same day a red flag was planted on the right bank of the Hooghly at a spot 50 miles by river above Fort William and three miles from Simurali Railway Station. The depth of water in midstream at this spot at high tide was 13 feet. The depth one mile further up was 24 feet but as the East Indian Railway was one mile away I decided on the spot first chosen. The barge was anchored at this spot the same evening and police guards were stationed on the bank with instructions to see that no vessels approached too near.

XIV. After reporting the above matter to the Government of Bengal and after making necessary recommendations I was on the 25th May 1921 requested to destroy the barge.

XV. On the 21st May 1921 I proceeded up the river and inspected the barge again and removed from the deck all loose iron and wood. The depth of loose Nitro-Glycerine in the bilges was now 4 inches.

XVI. The following six days were occupied in making all necessary preparations for the destruction of the barge on the 28th May 1921, at 9 A.M. Railway time. These preparations included :—

- (1) Provision of charges, a mile and a half of submarine twin cable, exploders and all the various other necessary electrical apparatus,
- (2) Engagement of a staff of electricians, carpenters, etc., etc.,
- (3) Arranging for pay, rates of messing and insurance of the members of the expedition,
- (4) Provision of four launches of various sizes, &c.
- (5) Arranging for police guards for both banks of the river and to clear all persons out of a circle of one and a quarter mile radius round the barge before 7 A.M. on the morning of the 28th May 1921,
- (6) Arranging with the East Indian Railway and Eastern Bengal Railway to remove all trains on their lines between certain stations before 8-45 A.M. on the 28th and until further notice,
- (7) Provision of a Cinematograph and Operator.

XVII. On the 27th May the following proceeded up the Hooghly :—

Dr. N. L. Sheldon, Chief Inspector of Explosives in India.

Captain J. Bennett, Inspector of Explosives in India.

Mr. Tuckett of Messrs. Gillanders, Arbuthnot & Co.

Mr. S. P. Sturgis, Superintendent of Police, Hooghly.

Mr. C. Creed (Cinematograph Operator).

Q. M. S. Rickard, Royal Engineers,

Sergeant Chandler, Royal Engineers,

L. Sergeant Crook Royal Engineers,

Captain W. Fields, Royal Engineers,

together with 4 Indian ranks. In addition there were some sixty other persons of various occupations. The evening of the 27th May was spent in preparing five charges to be placed in the barge, and in further clearing the barge of all loose material on the deck and in making final arrangements.

XVIII. By 8-45 A.M. on the morning of the 28th, five charges of 50 lbs. each of Gelignite had been wired up and placed in the barge, the cases roped down to prevent them floating, the hatchways roped down securely, the cable laid to the firing point one and a half miles away, the barge sunk in 6 feet of water by cutting a hole in her side. Patrols had meanwhile been sent out to clear the ground and river in a circle of $2\frac{1}{2}$ miles diameter. The exploder was then pushed down exactly at 9 A.M.

XIX. A cinematograph record of the explosion, taken at a distance of one mile, recorded the results of the explosion. Each photograph was exposed for $\frac{1}{100}$ of a second with an interval of $\frac{1}{10}$ of a second between exposures. Each twelve exposures therefore represent just under one second of time. The column of debris reached its maximum height, which was 1,575 feet,

in six seconds. The cinematograph recorded only 660 feet of the total height of the column. The maximum diameter of the column immediately after the blast was 1,000 feet. Debris fell in a circle having a diameter of half a mile. No wave in the water was observed at the firing point neither could any depression in the bed of the river be found half an hour after the explosion. The shock of the explosion was very distinct at the firing point.

XX. After ascertaining that no damage had been done to either life or property in the surrounding district, the party recovered as much of the submarine cable as possible and returned to Calcutta. The train services were resumed a short time after the explosion had taken place.

XXI. Now that the damaged explosives had been rendered harmless it remained to ensure that any similar accident should not happen again. On the 14th June 1921 I called a meeting in Calcutta of the following :—

S. C. Stuart-Williams, Esq., Chairman of the Calcutta Port Commissioners.

Commander E. A. Constable, Deputy Conservator of the Port.

H. Bocquet, Esq., Eastern Bengal Railway.

H. Duncan, Esq., Bengal Nagpur Railway.

H. Robertson, Esq., East Indian Railway.

F. D. Bartley, Esq., Deputy Commissioner of Police, Calcutta.

W. F. Tuckett, Esq., Messrs. Gillanders, Arbuthnot & Co.

W. F. Scott, Esq., Messrs. Shaw, Wallace & Co.

W. J. Good, Esq., Secretary, Calcutta Port Commissioners.

At this meeting it was decided that the transport of high explosives through the Port of Calcutta should be prohibited in future, except for the small quantities of 500 lbs. or less.

XXII. On the 4th November 1921 I and Mr. Tuckett of Messrs. Gillanders, Arbuthnot and Co., proceeded down the Hooghly to endeavour to find a better landing place for explosives, and a few days later I recommended to the Government of Bengal that all explosives intended for the magazines at Bally, or for up-country stations which cannot be railed from Diamond Harbour, be transported by barge to Uluberia and then railed to their destination. Uluberia Railway Station is on the bank of the Uluberia Khal in which there is at all times a sufficient depth of water for the barges. The khal is nearer Moyapur and Diamond Harbour than Bowbazar. The barges of explosives will be well away from all traffic in the Hooghly and away from the oil installations at Budge Budge. A Notification is under issue making it clear that Uluberia Railway Station is the recognised railing station for the transport of explosives landed on the right bank of the Hooghly. In addition, the licensed capacity of the magazines at Bally has been increased and the storing of gunpowder there has also been sanctioned with the object of preventing any delay in unloading the barges at Uluberia and Moyapur. In addition the use of iron barges at Diamond Harbour in place of wooden ones has been sanctioned, the former being more seaworthy. I have also put forward a proposal that all barges carrying explosives carry a buoy with 15 fathoms of rope so that in case a barge sinks its position can be easily found.

XXIII. In conclusion I have to thank all those who were present at the destruction of the barge on the 28th May for their most valuable help in an undertaking which was exceedingly dangerous, but which nevertheless was brought to a successful issue without any loss to life or property. It should be noted that had the barge, which collided with Howrah Bridge exploded, that as over 60 tons of explosives were present in all the seven barges, the resulting explosion would have destroyed the bridge, Howrah railway station, and surrounding property and would have probably sunk all vessels in the Port within a large radius. The loss to life and property would have been immense.

A similar accident occurred later in Bombay Harbour involving the loss of 40 tons of high explosives. An account of this accident will be found in next year's Annual Report.

APPENDIX O.

Definition of Pipe line.

Pipe Line—A pipe line which passes completely through a "protected work" and is used for the transport of petroleum. Under this definition any pipe line which passes through a town or village or across country would require a license. Small pipe lines from railway sidings to installation would not.

FORM O.

(Rule 11 of Chapter V of Part II.)

General license to transport dangerous or non-dangerous petroleum in bulk by a pipe line.

No.

Fee, Rs. 100.

A general license is hereby granted to _____ to transport dangerous or non-dangerous petroleum in bulk in a pipe line between _____ and _____ subject to the rules contained in Chapter V of Part II of the Government of _____ Notification _____, and to the further conditions on the back of this license.

This license shall continue in force till the _____

Secretary to the Government of _____

ENDORSEMENT ON FORM O.

Conditions of license.

1. An extra casing shall be put over the pipe line when it crosses any railway.
2. The whole pipe line shall be sufficiently and efficiently patrolled.
3. As a precaution against excessive pressure in the pipe line at any time, an automatic by pass relief valve and a reliable pressure gauge shall be placed on the common discharge pipe at pumping stations.
4. A telephone or telegraph line shall be provided with connections at frequent intervals along the pipe line. One telephone or telegraph line shall suffice for a series of parallel pipe lines.
5. There shall be a gate valve provided at reasonable intervals.
6. Tank gauges shall be checked between stations at frequent intervals.
7. There shall be a responsible person placed in charge of each pumping station and also of each section of pipe line.

Secretary to the Government of _____

